

## **Appendix 2.1 NIOSH Construction Program History**

NIOSH research activities on construction have evolved over time. A short history divided into four phases provides context and a foundation for evaluating the current state of the program. Some examples of outputs are included for early periods to help portray the foundation for the 1996-2006 review period timeframe. Fewer outputs are described for the review timeframe since these are described in detail in Chapter 3.

### **1970 - 1990 – Period 1 - Individual projects and activities**

NIOSH did not organize research by industry categories during its early years and did not have a construction program per se. NIOSH did address issues relevant for construction via individual projects and activities. For example, construction was included in early surveillance projects such as the National Occupational Hazard Survey (NOHS) and National Occupational Exposure Survey (NOES) and the National Traumatic Occupational Fatalities (NTOF) surveillance program. Projects addressing construction topics such as asphalt fumes and silica were initiated during this period. Grants and contracts were also used to support a number of studies, such as epidemiological studies of risks in the painters' trades, research on silicosis and its association with sandblasting, and safety profiles for heavy equipment operation, wrecking and demolition, and tunnel and caisson work. NIOSH developed criteria documents and recommended standards on a variety of topics relevant to construction such as the following:

- 1973: Occupational exposure to noise
- 1973: Occupational exposure to ultraviolet radiation
- 1975: Working at elevated work stations, emergency egress from
- 1975: Silica, crystalline
- 1976: Emergency egress from elevated work stations
- 1977: Polychlorinated biphenyls (PCB's)
- 1977: Asphalt fumes
- 1978: Coal tar products
- 1978: Lead, inorganic (revised)
- 1980: Working in confined spaces (construction)
- 1983: Excavations, development of draft construction safety standards
- 1986: Occupational exposure to hot environments
- 1988: Welding, brazing, and thermal cutting
- 1989: Occupational exposure to asphalt fumes
- 1989: Occupational exposure to hand-arm vibration

NIOSH published four control technology reports in 1984 regarding asbestos removal at asbestos abatement sites. NIOSH also collaborated with EPA in jointly publishing a guide to *Respiratory Protection for the Asbestos Abatement Industry* in 1987.

The NIOSH Fatality Assessment and Control Evaluation (FACE) activity targeted fatal injuries of concern such as electrocutions, confined spaces, and excavation. These investigations led to specific outputs such as NIOSH Alerts (See Table A2.1 for list).

**Table A2.1** NIOSH Alerts in the 1980's Resulting from NIOSH FACE Investigations.

<b>Year</b>	<b>Hazard</b>	<b>Problem</b>
1985	Excavation Cave-ins	Deaths and injuries
1985	Contact between cranes and powerlines	Electrocutions
1986	Confined spaces	Fatalities
1987	Damaged receptacles and connectors	Electrocutions
1987	Undetected feedback electrical energy in power lines	Electrocutions
1987	Contact with electrical energy	Electrocutions
1989	Portable metal ladders near overhead power lines	Electrocutions

FACE, initiated in 1983, and NTOF (National Traumatic Occupational Fatality database) established in 1984 provided important inputs to construction research. Other important programs relevant for construction include SENSOR (Sentinel Event Notification Systems for Occupational Risk), which developed and supported state-based disease or injury condition-specific surveillance and intervention efforts, and ABLES (Adult Blood Lead Epidemiology and Surveillance) a program to track state-based laboratory-reported blood lead levels (BLLs) in adults. Both programs were begun in 1987.

NIOSH also provided testimony and comments to OSHA -Table A2.2 shows a list of testimonies that NIOSH gave regarding OSHA rulemaking from 1983 to 1991.

**Table A2.2.**Testimony provided by NIOSH Regarding OSHA Construction-Related Proposed Rules

<b>Year</b>	<b>Proposed standard</b>
1983	Underground construction
1985	Concrete and masonry construction
1987	Fall protection in the construction industry
1987	Scaffolds used in the construction industry
1987	Stairways and ladders used in the construction industry
1987	Excavations (hearing)
1987	Revision of construction industry test and inspection records
1988	Excavations in the construction industry
1988	Concrete and masonry construction safety standards, lift slab construction

In 1989, NIOSH sponsored a National Forum on Construction Safety and Health in Pittsburgh hosted by the Center of Excellence in Construction Safety of West Virginia University. The forum identified three problems requiring action: (1) education was needed at every level of construction from owners to workers, (2) the inclusion of safety and health protections in construction contracts, and (3) the need to focus on primary injury exposures.

## **1990- 1995 – Period 2 - Creation of the NIOSH Construction Program**

Increasing stakeholder interest and concern about construction safety and health issues, especially from construction trade unions, played an important part in encouraging Congressional hearings in 1990 about the level of resources and programs targeting construction.<sup>1</sup> NIOSH expenditures on construction research could only be estimated and were lower than expenditures for sectors such as manufacturing and mining. The NIOSH Construction Program was launched in 1990 when Congress provided funding (\$1 million) and authorized NIOSH to *“develop a comprehensive prevention **program** directed at health problems affecting construction workers by expanding existing NIOSH activities in areas of surveillance, research and intervention”*.

NIOSH took a number of important steps during the following years to lay a solid foundation for the program:

- As a first step, NIOSH co-sponsored a 1990 “National Conference on Construction Safety and Health” with the Northwest Center for Occupational Health and Safety in Seattle to identify leading causes of injuries and illnesses among construction workers and to build relationships with construction stakeholders and researchers interested in construction issues. A broad range of recommendations were made, including the need for research on the impact of interventions in reducing injuries and diseases.

- Requests for Applications (RFAs) were issued for two cooperative agreements the very first year to encourage extramural research in construction. Half of the appropriated funding was used to fund four cooperative agreements; two for state demonstration projects and two to identify, evaluate, and control work-related risks among construction workers [Myers, 1995]. Extramural research has played an important role in the NIOSH Construction Program ever since these early steps.

- A NIOSH-wide Construction Task Group was established to prepare a plan and budget initiative for construction research. Because NIOSH is organized into divisions that focus on a type of health outcome or research or service category, there was no logical division home for the program. Construction issues were viewed as encompassing all NIOSH divisions and a cross-divisional effort was undertaken to address construction. The task group produced a **“Construction Safety and Health Initiative”** document to guide efforts beginning in 1992. It included research activity and capacity building goals related to surveillance, research, and intervention.

---

<sup>1</sup> Representatives from the Laborers Health and Safety Fund of North America (LHSFNA) calculated that while the fatal injury rate for construction workers was more than three times higher than for manufacturing workers that U. S. government research spending was \$0.08 per construction worker vs. \$2.16 per manufacturing worker [NIOSH 1994]

Congress provided additional budget increases (varying from \$1.9 to \$3.9 million) each year for the next four years along with specific language to guide capacity building and provide direction and focus. Table A2.3 describes the Congressional language highlights and NIOSH Construction Program responses for the years 1990 to 1995.

<b>Table A2.3. – Congressional Direction and funding and NIOSH response during program start-up years 1990-1995</b>		
<b>Year</b>	<b>Congressional Charge and funding</b>	<b>NIOSH actions in response</b>
1990	<b>\$1 million</b> Develop a comprehensive prevention program directed at health problems affecting construction workers by expanding existing NIOSH activities in areas of surveillance, research, and intervention.	Half of appropriation used for intramural research and half for extramural programs: 2 cooperative agreements for state demonstration projects and 2 for identification, evaluation and control of work-related risks
1991	<b>\$1.9 million increase</b> Expand the construction safety and health program and include the development of surveillance data to identify and monitor emerging hazards in the construction industry, conducting research regarding fatalities and injuries among construction workers, and establishing training programs and demonstration projects to disseminate information concerning the prevention of injuries and illnesses in the construction industry	Expansion of intramural program and augmentation of existing cooperative agreements and addition of two new agreements
1992	<b>\$2.55 million increase</b> Examine work practices and workers' compensation records and establish training programs and demonstration projects concluding with the eventual development of comprehensive intervention and prevention plans	Issuance of 2 more RFA's for cooperative agreements on reducing musculoskeletal disorders among construction workers
1993	<b>\$3.97 million increase</b> Increase intramural research capacity; expand the Health Hazard Evaluation Program; establish research centers for construction safety and health to nonprofit universities to complement intramural programs; and develop community based intervention projects aimed at the prevention of construction-related diseases and disabilities	Expansion of intramural program projects, augmentation of HHE program for construction workers, and issuance of RFA for research grants in construction
1994	<b>\$2.65 million increase</b> Provide research grants at nonprofit universities and other nonprofit institutions directed at generating prevention initiatives. Establish a new 5 –year cooperative agreement with the construction trades to develop a center for prevention-oriented strategies and programs. Allow for training in the construction industry for the removal of lead	Additional budget resources were dedicated to the extramural program. An additional research grant RFA was issued, along with a new cooperative agreement dedicated to intervention research, and two lead abatement training grants.
1995	<b>No increase</b> Activities in surveillance and musculoskeletal disorders should be continued at current levels.	Issuance of an RFA to establish a "Prevention Center for Construction Safety and Health."

The Construction Program supported a **"National Conference on Ergonomics, Safety, and Health in Construction – Setting the Agenda and Creating a**

**Coalition”** held in Washington, DC in 1993. The conference was organized by CPWR and supported by the Building and Construction Trades Department (BCTD) of the AFL-CIO, OSHA, U.S. Department of Energy, the American Industrial Hygiene Association, the American Public Health Association, the National Constructors Association, the National Erectors Association, the National Safety Council, the Society for Occupational and Environmental Health, and the ANSI A-10 Committee on Safety in Construction and Demolition. It also involved participation by four international construction agencies and associations<sup>2</sup>. This meeting identified 15 critical hazards that should be controlled on each construction work site (see Table A2.4), and led to several key recommendations to build a national coalition for construction safety and health, strengthen national policy, safety and health programs on job sites, workforce development including safety and health training and certification, and new research. The recommendations for research were:

- **Data and Surveillance Systems** should be structured so exposure data can be used to target the development and demonstration of interventions.
- **Applied Research** should be expanded in the following areas:

**Industrial Hygiene:** Task-based approaches are needed to measure exposures. For exposures of greatest concern, devices should be developed that are real time, easy to use, and able to withstand conditions in the field. Industry wide studies are needed to determine the incidence or prevalence of disease by tasks or trade, identify exposures, develop dose-response information, and study the effects of short-term, high level exposures.

**Epidemiology:** NIOSH should complete proportionate mortality studies on all trades, industry-wide and case control studies should be performed to establish injury and illness prevalence and the associated exposures; and there should be more attention to the special risks faced by the growing female working population.

**Health Services:** Studies should focus on improving diagnosis of occupational injuries and illnesses; creating systems for the delivery of occupational medicine services to construction workers; finding ways to deliver secondary prevention in high risk workers; and determinants of disability, rehabilitation and return to work.

**Cost Effectiveness.** Economics research should be an integral part of efforts to improve safety and health in the construction industry.

- **Demonstration Projects** are needed to gauge the role of workplace culture on creating and preventing hazards in construction.[NIOSH, 1994]

---

<sup>2</sup> These were Bau-Berufsgenossenschaft (Germany); Bygghalsan (Sweden); Construction Safety Association of Ontario (Canada) and Stichting Arbeid (Netherlands)

<b>Table A2.4. Key hazards identified by the 1993 National Conference</b>		
<b>Type of Hazard</b>	<b>Type of Injury</b>	<b>Health Outcome</b>
Death & Traumatic Injury	Falls Being struck by/against Caught in/between Electrocution	
Musculoskeletal disorder	Lifting Awkward postures Repetitive motion Hand-tool vibration	Lower back/shoulder Knees/hips/shoulders/lower back Shoulders/neck/wrists Finger/wrists
Chronic health hazards	Noise Asbestos/fibers Lead/metals Solvents Hazardous wastes Heat/cold stress	Hearing Lungs Kidneys/nervous/reproductive systems Kidneys/liver/nervous system Kidneys/liver/nervous/reproductive systems Circulatory system

One suggested meeting recommendation was to hold regional conferences around the country to bring the national conference topics to additional construction stakeholders. CPWR organized these additional meetings in Atlanta, Boston, Cincinnati, and Tacoma in 1994.

To address the economics recommendation from the conference and the finding that there were few economists focused on characterizing the industry or studying the cost effectiveness of safety and health interventions, something that industry leaders were demanding before committing to investments in this area, CPWR engaged the late Professor John Dunlop of Harvard University to convene a Construction Economics Research Network (CERN).<sup>3</sup>

An important health hazard issue requiring early coordination and collaboration was lead poisoning among construction workers. In collaboration with NIOSH, OSHA published the document, *Working with Lead in the Construction Industry*, in 1991. In 1992, NIOSH issued an alert regarding lead (See Table 2.6). The Congress enacted the Housing and Community Development Act in 1992, which contained a section on lead hazards requiring that OSHA develop a construction industry interim standard within six months. OSHA promulgated a standard based upon a combination of the general industry standards and mandatory guidelines issued by the Department of Housing and Urban Development to protect lead-abatement workers [BNA 1993]. The final standard was issued in 1993.

In 1992, NIOSH and the National Institute of Standards and Technology jointly published a document, *Development of Draft Construction Safety Standards for Excavations*, which presented a simplified system for protecting workers from trench cave-ins. In addition, NIOSH issued an Update that warned of the typical

<sup>3</sup> CERN has gradually expanded to some 30 investigators, mostly economists.

70 deaths per year from cave-ins and reported on 627 deaths from cave-ins during the period, 1980-1988 [BNA 1992].

The National Asphalt Pavement Association (NAPA) came to NIOSH in 1993 with the issue of reducing asphalt fume exposure to its members' workers. NIOSH mounted an engineering control program in collaboration with the NAPA and six paving contractors. The NAPA received a grant from the Federal Highway Administration to improve fume control on highway pavers, and NIOSH collaborated in evaluating the prototypes developed by equipment manufacturing companies. The NIOSH evaluation lent to improvements in fume control designs that covered 80% of highway-class paver sales.

Also in 1993, CPWR convened a conference in Florida, "Prospects for Private Sector International Cooperation on Construction Safety and Health," which brought together leaders in construction safety and health from Canada, Japan and several European countries with the aim of learning from them the main lessons that the US could apply to shorten its learning curve in this field. This conference led to the formation of the International Roundtable on Construction Safety and Health, with the objective of industry leaders meeting annually to share informally both program successes and failures.

In 1994, NIOSH awarded a contract per its responsibility under the Housing and Community Development Act of 1992. The NIOSH responsibilities included the award of grants for training and education of workers and supervisors involved in lead-based painting and the assessment of these programs. In 1993, by agreement with NIOSH, the Occupational Health Foundation, a CPWR sub-grantee, prepared Model Specifications for the Protection of Workers from Lead on Steel Structures as a result of deliberations a working group convened by the CPWR and the Steel Structures Painting Council.

In 1994, the first annual NIOSH/CPWR Engineering Work Practices and Controls meeting was held to bring together Construction Program supported researchers and union, contractor, and government stakeholders interested in engineering control and intervention research to share and discuss findings and needs in construction.

By 1994, the NIOSH Construction Budget was \$11.8 million<sup>4</sup> and NIOSH had greatly expanded its intramural and extramural research program. Extramural activity included state demonstration projects and several cooperative agreements and research grants. Congressional language in 1994 had directed NIOSH to establish *"a new 5-year cooperative agreement with the construction trades to develop a center for prevention-oriented strategies and programs"* which led to an RFA for a "Prevention Center for Occupational Safety and Health

---

<sup>4</sup> The Congressional Conference action amount was \$12,158,000 in 1994. The end allocation to NIOSH was \$11,868,404 [Myers, 1995, p6]

in the Construction Industry". The resulting competitive award went to the CPWR and a consortium it developed with ten academic institutions.

NIOSH awarded eight cooperative agreements and eight research grants under this initiative. Three of the agreements aimed to demonstrate model safety programs that could be sustainable following the award period. Another agreement was established with CPWR with multiple objectives, but drawing on collaboration with 15 construction unions and the employers they work with. Three agreements aimed to evaluate and prevent musculoskeletal disorders – one with CPWR, one with the Greater Cincinnati Occupational Health Center in collaboration with a carpenters union and local contractors, and another with the Carpenters Health and Safety Fund of North America. An agreement was also established with Yale University to fund the Connecticut Road Industry Surveillance Project (CRISP).

Research Grants during this period addressed several problems including: (1) an evaluation of controls to protect lead exposed workers, (2) load monitoring to prevent the collapse of formwork and shoring, (3) an analysis of overexertion injuries, (4) sampling for airborne hazards, (5) development of an injury predictive model, (6) a study of respiratory diseases among carpenters, (7) a study of elevated blood lead levels among construction workers, and (8) the development of an exposure matrix for painters.

CPWR established a "Small Studies program" as part of its cooperative agreement to award funding of up to \$20,000 to support projects based on merit that could have a practical impact on the construction industry. The aim was to support pilot studies, stimulate new investigators, and explore opportunities that arise with short notice.

NIOSH intramural projects addressed the surveillance, evaluation, and control of exposures related to noise, musculoskeletal stressors, lead, asphalt fumes, asbestos substitutes, silica sand, heat stress, falls, and falling objects. In addition, several proportional mortality studies were launched in cooperation with CPWR for the different construction trades. NIOSH responded to a large increase in requests for Health Hazard Evaluations (HHEs) (60 requests were filed in 1993, and 43 more from 1993 to 1996 in comparison with a total of 40 during all previous years), FACE investigations, and technical inquiries regarding construction workers. NIOSH also developed an instructional module related to construction safety and health and mounted an information dissemination program related to construction safety and health. NIOSH, in collaboration with the American Society of Civil Engineers, developed an instructional module for civil engineering faculty to use in teaching engineering students about safety and health. Tables A2.5 and A2.6 listing NIOSH Alerts and MMWR reports from this period are provided below:



**Table A2.5. - NIOSH Alerts 1990 -1995 Resulting from NIOSH Investigations.**

<b>Year</b>	<b>Hazard</b>	<b>Problem</b>
1990	Falls through skylights and roof openings	Deaths and injuries
1991	Work with Scaffolds Near Overhead Power Lines	Electrocutions
1992	Lead exposure to construction workers	Lead poisoning
1992	Falls from suspension scaffolds	Deaths and injuries
1993	Working from Scaffolds	Falls, falling objects, electrocutions
1993	Trench cave-ins	Deaths
1993	Metal –reinforced hydraulic hoses	Deaths and injuries
1995	Crane operations near overhead power lines	Electrocutions

**Table A2.6. MMWR Reports 1990-1995 Resulting from NIOSH Investigations.**

<b>Year</b>	<b>Hazard</b>	<b>Problem</b>
1990	Falls through skylights and roof openings	Deaths and injuries
1991	Work with Scaffolds Near Overhead Power Lines	Electrocutions
1992	Lead exposure to construction workers	Lead poisoning
1992	Falls from suspension scaffolds	Deaths and injuries
1993	Working from Scaffolds	Falls, falling objects, electrocutions
1993	Trench cave-ins	Deaths
1993	Sand blasting	Silicosis
1995	Crane operations near overhead power lines	Electrocutions
1995	Sandblasting	Silicosis

The Construction Program published the “1994 FACT BOOK: National Program on Occupational Safety and Health” as the first compendium to describe NIOSH Construction Program activities. It provided short descriptions of 51 projects, including 35 intramural projects, 8 cooperative agreements and 8 research grants [NIOSH 1994]. A Symposium was held in 1994 to bring together NIOSH and grantee investigators to exchange research findings and to highlight progress.

Beginning in 1995, the Congress directed that Construction Program activities be continued “at current levels”. Similar appropriations language has been provided each year since then. Congressional language has also included concerns about the number and rate of construction fatalities in recent language accompanying appropriations details.

The Construction Program supported and co-sponsored with the National Construction Center a “Second National Conference on Ergonomics, Safety, and Health in Construction” in 1995. The conference program was planned in conjunction with a “Construction Industry Labor-Management 1990s Committee” formed from the BCTD and 7 contractor associations to address construction safety and health issues after the 1993 national conference. A total of 37 organizations co-sponsored the meeting. The conference aimed to mesh the

protection of construction workers from occupational disease and injury with the continued viability of the industry and set a national agenda for construction safety and health. The conference addressed workers' compensation, worker certification on safety topics, surveillance, exposure measurement, limited duty, economics, and demonstration projects. Ergonomics was stressed because of the prevalence and cost of musculoskeletal disorders among construction workers. It identified 15 main hazards and focused on four areas where safety and health interventions were needed:

- Improved planning, organization and management of the construction work site.
- New construction technologies and work practices.
- Improved training of workers and supervisors.
- Improved data collection and performance evaluation.

The meeting was an important vehicle for transferring research findings to construction stakeholders, for fostering partnerships, for identifying research gaps, priorities, and opportunities, and for moving research into practice. It also established best practice benchmarks based on evidence from high performance nations and segments from within the US. These (see Table A2.7) were viewed as challenge benchmarks that the US construction industry should be able to meet.

**Table A2.7:** Performance Benchmarks for the US Construction Industry, 1995

Area	Performance Goal	Projected Reduction
Deaths	<3 cases per 200 million hours	From 950-160 deaths/year (83%)
Lost-time injuries	<1 case per 200,000 hours	From 226,000 to 38,000 cases/year (83%)

[CPWR, 1995]

In 1995 the NIOSH Director requested that an external review be performed for the “National Program for Occupational Safety and Health in Construction”. The outside panel selected to perform the evaluation focused on two areas: 1) NIOSH management and coordination, and 2) future research directions (The results of the review are described in the next section of the history).

By 1995, the Construction Program had an \$11.8 million a year budget, with intramural projects originating in every NIOSH division. It included a multi-disciplinary “National Construction Center” cooperative agreement with CPWR to build capacity and demonstrate effective surveillance and intervention mechanisms. The cooperative agreement mechanism allowed close collaboration between NIOSH intramural researchers and CPWR in-house researchers, the university-based research consortium, and with construction industry unions and contractor organizations.

The Construction Program also had issued research grants to several academic researchers and state-based programs and partnerships. For example, a

cooperative agreement with the Construction Safety Council of Illinois led to a program to provide construction worker safety and health training and a regional conference. In addition, large national conferences had for the first time brought together researchers and construction stakeholders to discuss research needs and priorities to guide research and to guide other steps needed for improvements in industry performance. Ongoing and completed research resulted in numerous peer-reviewed publications. An Occupational Medicine State of the Art Review was published on Construction Safety and Health in 1995. It was edited by Construction Center researchers and included 15 chapters by various Construction Program and other researchers. [Ringen et al.1995].

### **Strategic Planning during this period (1990-1995)**

The major strategic inputs during this period were the Congressional mandates and directives (described in Table 2.5) combined with construction stakeholder input obtained from national conferences. Some inputs addressed capacity-building recommendations (e.g. 1991 Congressional language directing NIOSH to “establish training programs and demonstration projects to disseminate information concerning the prevention of injuries and illnesses in the construction industry”) and others addressed specific hazards or approaches (e.g. 1991 Congressional language directing NIOSH to conduct research regarding fatalities and injuries among construction workers).

NIOSH leadership, working with a NIOSH-wide Construction Task Group, used this input along with researcher inputs to develop a 1992 “Construction Safety and Health Initiative” plan with goals and objectives to guide the Construction Program. The plan included research activity and capacity building goals related to surveillance, research, and intervention. It also identified construction workers as special population targets for national fatal and non fatal injury goals under the U. S. Department of Health and Human Services Healthy People 2000 national health objectives for the year 2000. Excerpts from the plan are provided in Table A2.8.

<b>TABLE 2.8. 1992-1993 Construction Safety and Health Initiative Goals and Objectives</b>	
<b>National Construction Objectives under Healthy People 2000</b>	
Reduce Deaths from Work-related Injuries	Reduce construction worker deaths by 30% from 1990 to 2000 (From an average rate of 25 deaths /100,000 employees as a 1983-87 average to a rate of 17.0/100,000 employees in 2000)
Reduce Work-related injuries	Reduce work-related injuries resulting in medical treatment, lost time from work, or restricted work activity among construction workers by 33% to no more than 10.0/100 in 2000 (from an average of 14.9/100 for 1983-87)
<b>General National Objectives considered relevant for Construction</b>	
Cumulative Trauma Disorders	Reduce cumulative trauma disorders to an incidence of no more than 60 cases per 100,000 workers (Baseline: Average of 100 per 100,000 in 1987)

Occupational Skin Disorders	Reduce occupational skin disorders or diseases to an incidence of no more than 55 per 1000,000 full-time workers (Baseline: Average of 64 per 100,000 during 1983-1987)
Exposure to Excessive Noise Levels	Reduce to no more than 15% the proportion of workers exposed to average daily noise levels that exceed 85 dBA. (Baseline data to be available in 1992)
Exposure to Excessive Levels of Lead	Eliminate exposures which result in workers having blood lead concentrations greater than 25 ug/dL of whole blood (Baseline: 4,505 workers with blood lead levels above 25 ug/dL in 6 states in 1988)
Implement State-based Occupational Safety and Health Plans	Implement occupation safety and health plans in 50 states for the identification, management, and prevention of leading work-related diseases and injuries within the state (Baseline 10 states in 1989)
Prevention of Occupational Lung Diseases	Establish in 50 States exposure standards adequate to prevent the major occupational lung diseases to which their worker populations are exposed (asbestosis and silicosis reign high in some construction populations) (Baseline data available in 1991)
Worksite Health and Safety Programs	Increase to at least 70% the proportion of worksites with 50 or more employees that have implemented programs for worker health and safety (Baseline data available in 1991)
<b>Activity Goals in support of Objectives</b>	
Surveillance	Develop a capacity for identifying and monitoring hazardous working conditions and their consequences in the construction industries, and use this capacity in directing intervention strategies.
Research	Conduct the following types of applied research in the construction industries: - Causal research to identify and investigate the relationships between underlying causes such as hazardous working conditions and associated occupational diseases and injuries. - Methods research to develop more sensitive means of evaluating hazards on construction worksites, as well as measuring early markers of adverse health effects and injuries - Control research to develop new protective equipment, engineering control technology, and work practices to reduce the risks of occupational hazards
Intervention	Develop effective practical strategies to prevent construction deaths, injuries and diseases, and to ensure that every employer and employee in the industry knows how to implement them.

The plan provided an important blueprint for Construction Program efforts. It described the importance of collaboration with other agencies, and recognized that the construction industry, including both labor and management, was an essential partner in providing input on research and intervention needs. It laid out a strategy to initiate, conduct, and sponsor (through an extramural grants program) applied investigative studies based on surveillance data, field studies, and constituency concerns.

The plan served to direct intramural NIOSH research for 1992 and 1993. The goals and objectives were communicated to extramural researchers via guidance language included in the text of RFAs published during these years. The plan served to integrate stakeholder concerns and direct research during a period of

tremendous growth of the program, and it provided an important planning foundation for future efforts.

### **1996 - 2004 – Period 3 - National Occupational Research Agenda (NORA) and External Review**

In April of 1996, NIOSH and its partners unveiled the National Occupational Research Agenda (NORA), a framework to guide occupational safety and health research into the next decade – not only for NIOSH but for the entire occupational safety and health community. Approximately 500 organizations and individuals outside NIOSH provided input into the development of the Agenda – which included 21 “Priority Research Areas” in three categories: Disease and Injury, Work Environment and Workforce, and Research Tools and Approaches (*See Table from Chapter 1*). Construction was suggested as a top priority candidate by two of five working groups (including the internal NIOSH group) during the NORA process but in the end a more cross-cutting approach to topics was taken [Rosenstock et al 1998]. However, the importance of high risk sectors was recognized, resulting in the use of a matrix approach to track, manage, and report on the NORA-related research being performed in construction and other high risk sectors.

Another major development for the Construction Program during this period was responding to the recommendations coming out of the 1995 external review. The final management and coordination recommendations provided by the External Review Group are briefly summarized below:

- Establish an overall management structure for the Construction Program to further develop and implement a long-term strategic plan for intramural and extramural funding.
  - Review all research programs for scientific merit and for relevance to the construction industry
  - Promote effective internal and external communication between and among investigators studying similar tasks or hazards
  - Formulate a plan to disseminate effectively program results to customers and to enhance the visibility of NIOSH work to all outside groups, including the general public.
  - Have available, as employees or consultants, persons experienced in construction.
  - Enhance coordination with OSHA.
  - Identify a limited number of measures to evaluate nationwide the effectiveness of the Construction Program.
- [Snell, 1996]

In 1996, NIOSH formed a Construction Steering Committee (CSC) to implement the coordination and planning called for in the evaluation report. The CSC included a coordinator and a representative from each NIOSH division and lab. It

began work to increase internal and external communication, and established a review process for proposed construction projects. It used face to face meetings and monthly video conference meetings to accomplish this work. The CSC also encouraged construction research through intramural funding of small scale feasibility studies, many of which were later developed into major projects, e.g., well drilling hazards.

In 1996, NIOSH and CPWR and its Construction Center consortium members held a "Program Planning Conference" in Cincinnati to review accomplishments from the first five years of the program, to discuss research needs and the results from the external review recommendations, to promote communication, and to identify some proposals for the future. The 2 day meeting drew 140 participants from the construction industry, government, and academia.

By 1996, the first major NIOSH construction research partnership, which had begun work in 1993 on asphalt was well underway, testing paving methods to lower occupational PAH exposures by reducing the temperature of asphalt and improving venting of fumes from paving machines. The Asphalt partnership was the 1999 winner of the *NORA Partnering Award for Worker Health and Safety*.

In 1996, NIOSH supported a cooperative agreement with the National Environmental Education and Training Center (NEETC) in Pennsylvania that addressed the hazards of emerging technologies related to environmental remediation, jobs that are typically given to construction workers. The agreement brought together representatives from EPA, ATSDR, OSHA, DOD, and NIEHS as well as from CPWR and West Virginia University. NEETC convened a conference in 1997 that examined approaches to prevent hazards as technologies emerge through the steps of concept, design, verification, and deployment.

NIOSH helped to launch a partnership effort with OSHA, MSHA and a variety of construction and other stakeholders in 1996 to raise awareness about silica hazards.

In 1997, NIOSH and CPWR sponsored the 1<sup>st</sup> International Symposium on Ergonomics in Building and Construction in Tampere, Finland in collaboration with the International Ergonomics Association. The conference addressed surveillance, ergonomic assessments, ergonomics in the trades, and prevention of musculoskeletal disorders.

In 1997, the Construction Program published a second Construction Compendium to describe ongoing research projects. Reflecting the importance of NORA, the 45 extramural and 74 intramural projects described in the compendium were organized by NORA priority research topics [NIOSH, 1997].

The first edition of *The Construction Chart Book* was published in 1997 by the NIOSH Construction Center. It contained 47 sets of charts providing for the first time a set of comprehensive descriptive statistics about the construction industry and its safety and health performance. A second edition was published by the Construction Center in 1998. By 2004, CPWR had distributed some 18,000 copies of this report, which served as the model for NIOSH's larger Chart Book on overall safety and health.

The Construction Program, working together with the NIOSH Traumatic Injuries Program, participated in the first National Occupational Injuries Research Symposium (NOIRS) in 1997. The meeting, which provided an important venue for injury research issues, included seven sessions addressing construction injuries. The 2000 and 2003 NOIRS meetings also incorporated multiple construction research sessions.

Alerts and reports published in Morbidity and Mortality Weekly Reports during this period are listed in Tables A2.9 and A2.10.

**Table A2.9.** NIOSH Alerts/ Workplace Solutions 1996 -2004 Resulting from NIOSH Investigations

<b>Year</b>	<b>Hazard</b>	<b>Problem</b>
1997	Asphalt Fumes from Roofing Kettles	Worker Exposure
1998	Skid-Steer Loaders	Injuries and Deaths
1998	Traffic-Related Motor Vehicle Crashes	Worker Injuries and Deaths
1998	Small Gasoline-Powered Engines and Tools	Carbon Monoxide Poisoning
2001	Construction and Maintenance of Telecommunication Towers	Injuries and Deaths from Falls
2004	Skylights and Roof and Floor Openings	Falls of Workers
2004	Hydraulic Excavators and Backhoe Loaders	Injuries

**Table A2.10.** - MMWR Reports 1996-2005 Resulting from NIOSH Investigations

<b>Year</b>	<b>Hazard</b>	<b>Problem</b>
1996	Skid-Steer Loader	Fatalities
1997	Abrasive Blasting	Silicosis
1997	Surveillance	Silicosis
1998	Deaths Young Workers	Silicosis
2004	Trenching and Excavation Work	Occupational Fatalities
2005	Mortality, Prevention, and Control	Silicosis
2005	Nail-Gun	Injuries

In 1999, NIOSH researchers from the Construction, Agriculture, and Mining Programs met to discuss ways in which collaboration among researchers could add value and improve coordination of research. The "CAMP" workshop helped identify cross-cutting research topics (for example, better designed ventilation of equipment cabs) that would benefit workers performing similar operations in all

three sectors. This meeting led to additional research collaboration – especially between construction and mining.

In 1999, Construction Program and Center staff began collaborating to develop a web-based construction safety and health clearinghouse. The resulting Electronic Library of Construction Occupational Safety and Health (eLCOSH) was launched in 2000. This has become a primary resource for construction safety and health stakeholders.

The Construction Center developed a standardized safety and health hazard awareness training program for construction workers, which was adopted by the Building and Construction Trades Department, AFL-CIO, and its employers. This *Smart Mark* program was recognized by OSHA as a model training program for the industry, and to date approximately 50,000 construction workers had been trained by 1999. Employers have partnered with CPWR to fund and disseminate this program.

In 2000, the Healthy People 2000 goals, originally set in 1992, were reviewed and updated for 2010. This initiative is a Department of Health and Human Services national health promotion and disease prevention agenda for the nation. Occupational Safety and Health is one of 28 focus areas. Both measurable HP2000 Construction goals were met (The 1999 fatal injury death rate was 14.0 per 100,000 workers, better than the 30% reduction target of 17.0 deaths per 100,000; the 1999 nonfatal injury rate was 8.7 injuries per 100 fulltime workers, better than the 30% reduction target of 10 injuries per 100 full-time workers). The corresponding HP 2010 goal targets are: 10.2 fatal injuries per 100,000 workers, and 6.1 injuries per 100 fulltime workers.

In 2000, the Construction Program provided extensive input to a report prepared for the Construction and Building Subcommittee of the Committee on Civilian Industrial Technology (CCIT).<sup>5</sup> The subcommittee established seven National Construction Goals, with goal seven addressing reductions in construction worker illnesses and injuries [Chapman, 2000]. The Construction Program also contributed program budget information to a survey of federal construction research performed by RAND for the Construction and Building Subcommittee. The survey found that for the year 1999, that the federal government funded more than 1600 projects representing more than \$545 million in construction and building related research and development across nine departments and three independent agencies.<sup>6</sup> Reduction of construction work illness and injury was

---

<sup>5</sup> CCIT was one of nine research and development committees established by the National Science and Technology Council, a cabinet level group charged with setting federal technology policy. The mission of the Construction and Buildings Subcommittee was to enhance the competitiveness of US industry, public safety, and environmental quality through research and development in cooperation with US industry, labor, and academia, for improvement of the life cycle performance of constructed facilities.

<sup>6</sup> The study was done by searching the RAND database called RaDiUS, which stands for "Research and Development in the United States". It was developed by RAND in cooperation with the National Science Foundation to better support the White House Offices of Science and Technology Policy and the National Science and Technology Council.



one of 18 categories examined and was found to represent 9% of awards and 3% of annual funding [Hassel et al, 2001].

In 2001, Congress directed NIOSH to expand the Construction Program by appropriating funds for a three year grant to Purdue University. Following a peer-review application process, this led to the formation of a "Construction Safety Alliance" partnership project based out of the Purdue Division of Construction Engineering and Management.

The success of the Construction Chart Book was one factor stimulating NIOSH to create its own National Worker Health Chartbook in 2000. The 2004 NIOSH Chartbook included a chapter on "High Risk Industries and Occupations" and Construction Center researchers collaborated with NIOSH on the Construction Trades section.

NIOSH Construction Steering Committee members met with the CPWR Construction Center and Consortium members in June of 2001 to discuss coordination issues and ideas for an upcoming May 2002 National Construction Meeting. The Construction Center cooperative agreement included provisions for a national construction meeting and a decision was made to partner with the Construction Safety Council for a 2002 meeting. The Construction Safety Council meeting, begun with support from the NIOSH Construction Program, has become self-supporting and has evolved from a regional to a national construction meeting. The 2002 meeting was also used for ongoing coordination discussions between NIOSH and Center Consortium researchers.

The third Construction Compendium was published in 2003. It contained descriptions of 49 intramural and 67 extramural Construction Program projects [NIOSH, 2003].

The Acting NIOSH Director presented on "Mutual Interests in Construction Safety and Health" at the Construction Industry Institute's 2002 Annual Conference. Some of the potential areas of mutual interest suggested by NIOSH included: intervention effectiveness tools for evaluating proposed best practices; design for safety approaches; diverse workforce challenges (Culture, language, gender); changes in work organization; health hazards; emerging technology; and increasing the overall amount of construction research.

The Construction Program arranged a face to face meeting with OSHA's Directorate of Construction in 2003. With opening remarks by NIOSH Director John Howard and OSHA Assistant Secretary John Henshaw, the meeting was used to provide updates on current projects and to discuss current priorities.

In 2003, the Construction Program and Center were both involved with co-sponsoring the first national conference on "Designing for Safety and Health in Construction" in Portland, Oregon. This meeting brought together construction

safety and health experts, contractors, facility owners, engineers, and architects to discuss the use of design as an intervention to prevent hazards associated with construction.

The NIOSH Construction Program matured and entered a stable but flat funding period during these years. The program had put in place a capacity for surveillance and internal mechanisms to improve program management and had made a transition to development and diffusion of interventions.

### **Strategic Planning during this period (1996-2004)**

The major strategic inputs during this period were the NIOSH-wide NORA priority topic areas and the external review recommendations. These inputs included capacity-building recommendations (e.g. the External Review Committee recommendation for the development of a management structure for the program to further develop and implement a long-term plan for intramural and extramural funding) to inputs about specific hazards and approaches.

NORA had an important impact on the NIOSH Construction Program because it superimposed 21 topic areas as primary priorities for all NIOSH supported research, including construction research. Because the NORA priorities included topics that were also highly relevant for construction (e.g. Traumatic injuries, Musculoskeletal disorders, Hearing loss, Special Populations at Risk) NORA did not inhibit construction research. However, because of the cross-cutting nature of the NORA priority research areas, it served to increase the proportion of projects where the primary focus was the NORA topic with construction a secondary consideration. For example, a project might focus on a NORA topic related to methods development or exposure assessment, for a hazard known to affect construction and other high risk sectors.

The Construction Program developed two mechanisms for communicating strategic planning priorities. First, the Construction Steering Committee prepared annual guidance for new construction projects which was disseminated along with NIOSH-wide guidance to internal NIOSH researchers and policy analysts during project planning season. Second, the CSC utilized expanded text in upcoming RFAs to communicate research needs and priorities to the extramural community.

For example, the Construction Program utilized a 1997 construction RFA to highlight the new NORA topics and to encourage extramural research on “high priority directions” which were a slightly modified listing of the “future research topics” that had been suggested by the External review committee (See Table A2.11). It also included these program priorities: “reduce construction-related deaths, lost-time injuries and illnesses, back injuries, eye injuries, skin disorders or diseases, lead poisonings, hearing loss, silicosis, and asbestosis.”

**Table A2.11.** Excerpt from “*Intervention Studies for Construction Safety and Health Notice of Availability of Funds for Fiscal Year 1997*” showing mention of NORA and “high priority” directions from external review (emphasis added)

....The overall NIOSH program priorities, including those related to the construction industry, were developed by NIOSH with input from its partners in the public and private sectors to provide a framework to guide occupational safety and health research in the next decade - not only for NIOSH but also for the entire occupational safety and health community.

....The Agenda identifies 21 research priorities. These priorities reflect a remarkable degree of concurrence among a large number of stakeholders. The NORA priority research areas are grouped into three categories: Disease and Injury, Work Environment and Workforce, and Research Tools and Approaches. The NORA document is available through the NIOSH Home Page; /niosh/nora.html.

**Consistent with NORA, the following are high priority directions for research under this announcement.** Investigators may also apply in other areas related to construction safety and health, but the rationale for the significance of the research and demonstrations to construction must be developed in the application.

1. Understand how economic issues impact the acceptance of best safety practices.
2. Understand the aspects of changing the safety culture in organizations, including residential and other small contractors.
3. Improve the health and safety aspects of construction tools and of general technology development/utilization.
4. Identify effective ways to obtain information and conduct research on non-union workers and contractors.
5. Identify training techniques that are effective in causing safe work practices to be adopted.
6. Investigate mechanisms that lead to nongovernmental support/funding for regional training and safety and health services.
7. Investigate new concepts for job-site improvement (such as scheduling of deliveries, material location and transport in vehicular worker traffic patterns, etc.).
8. Identify causes of dramatic differences in regional injury rates for both small and large firms, as well as union and non-union operations.
9. Select focus areas that will be of perceived immediate benefit to the customers.

**(Based upon achievable benchmarks in construction safety and health, the NIOSH program priorities applicable to this Program Announcement are to reduce construction-related deaths, lost-time injuries and illnesses, back injuries, eye injuries, skin disorders or diseases, lead poisonings, hearing loss, silicosis, and asbestosis.)**

The Construction Program Steering Committee also integrated the “future research topics” suggested by the External Review Committee (see table 2.13) into annual Program Planning guidance for intramural researchers.

Given the importance of the large Construction Center cooperative agreement to the NIOSH Construction Program, the CSC prepared in advance to develop an approach and emphasis to include in the second Center RFA proposal. Building upon the surveillance foundation created by the first Construction Center RFA, the second RFA was structured to maintain and expand ongoing surveillance while generating new coordinated extramural research on construction interventions, information and technology transfer, and preventive systems research. The scope for interventions could include policies, regulations, education and training, government and private outreach programs, and control technology and new technology for preventing injury and work-related diseases. Because the 21 NORA topic areas were established as prominent nationwide priorities, submitters were asked to focus on NORA priority areas relevant to construction when responding to the request. The Construction Program provided additional guidance and specificity, especially for those more general NORA topics such as “Traumatic Injury” (See RFA excerpts in Table A2.12).

**Table A2.12** Excerpts from 1999 Construction Center RFA: *Safety and Health Interventions in the Construction Industry* (emphasis added in excerpts)

**....Many of the National Occupational Research Agenda (NORA) priority areas are relevant to the construction industry and should be considered when responding to this Request for Assistance. These include, preventing hearing loss, back disorders, asthma, and dermatitis and reducing or eliminating traumatic injuries (caused by falls, electrocutions, struck-bys or contact with materials/objects). In addition, there are other high priority problems in construction that are not explicitly included in NORA, such as silicosis and lead poisoning, that should be addressed.**

*National Construction Center activities were to include:*

### **1. Innovative Pilots or Feasibility Studies**

- a. Create implement innovative pilot/feasibility project to reduce injury/illness in construction.
- b. Establish partnerships with small businesses and independent contractors, unionized contractors to develop, implement and evaluate pilot work looking at the health and safety needs of the entire spectrum of the construction workforce.

### **2. Intervention Evaluation Research**

- a. Implement and evaluate intervention initiatives to reduce construction-related injury/illness through partnerships. Incorporate economic analysis into the evaluation process for intervention study.
- b. Identify and utilize data to target at risk groups. Develop interventions aimed at improving best practices; develop detailed plans for modifying best practices based on data. Identify existing or develop new intervention initiatives designed to improve best practices for specific industry sectors and operations within individual sectors. Evaluate intervention initiatives for implementing and evaluating the effectiveness of the intervention throughout the targeted industry sector in future years.
- c. Develop, implement, and evaluate employee/employer safety and health approaches.
- d. Develop study designed to evaluate the effectiveness of worker training programs across multiple trades, on multiple issues of concern, and on using different training modalities. Evaluate the state of existing training programs and develop standardized safety and health training for the industry. Evaluate the effectiveness of training interventions using data collected.

### **3. Information and Technology Transfer**

- a. Develop, implement, and evaluate various aspects of the information transfer process within

the construction industry.

- b. Demonstrate the ability to create and maintain an infrastructure to be a central clearinghouse for collecting and disseminating health and safety related information to the construction industry.
- c. Develop studies to identify the various means that construction firms use to obtain safety and health information.

#### **4. Preventive Systems Research**

Develop a research agenda which include (1) studies of policies and procedures that facilitate or hinder the adoption and implementation of effective best practices and interventions, and research on the technology of effective dissemination; (2) studies of the effects of age, gender, ethnicity, organizational, or sociocultural factors that affect access to, or use of, available best practice preventive interventions; and (3) studies of the costs associated with implementing best practice preventive interventions and methods of financing such interventions.

#### **5. On-Going Surveillance**

- a. Identify pertinent databases and update and expand them where possible.

#### **6. Review Priorities**

- a. Develop a system to continuously review surveillance and intervention outcome data to establish priorities for research under this cooperative agreement.
- b. Convene a national conference for the purpose of sharing information, establishing priorities, and facilitating joint approaches for developing construction industry interventions and to identify and critique current “best practices” for specific construction trades and industry sectors.

This RFA, issued and competed in 1999, led to a second five year competitively awarded cooperative agreement with CPWR and its university consortium that began in 2000.

The NIOSH Construction Program had begun a multi-phase process beginning in 1997 to assess progress and to identify construction research gaps to develop a long-term strategic plan in response to external review recommendations. A gaps analysis using the public health framework was performed over several years resulting in a “Research Activity Matrix” or RAM. The RAM listed and ranked 12 basic categories containing 58 different “Construction Outcomes, Conditions, and Overexposures”. It portrayed existing research via 14 different research activity categories. The RAM provided a visual picture of NIOSH construction research and it was used to assist project planning by improving identification of high priority outcomes and their gaps. The CSC began to include the gap topics identified by the RAM in annual project planning guidance for development of new intramural research projects beginning in 1998.

The NIOSH Construction Steering Committee shared the RAM with Construction Center researchers beginning in 2000 and incorporated the Construction Center projects into the RAM to get a more comprehensive picture of research gaps and opportunities. In addition, a workshop was held at the February 2000

Construction Safety Council Conference to describe and discuss the preliminary list of construction outcomes, conditions, or overexposures needing additional research. Attendees were asked to provide their scores for whether each topic was of low, medium, or high priority. These results were used for considered and the RAM was then used to generate a list of **NIOSH High Priority Construction Topics**. These priorities served to integrate NORA priorities, various cross-

cutting industry approaches originally suggested by the earlier external review, and the results of the Construction Steering Committee and Construction Center inputs on research gaps. The priority topics were organized into three topic categories: 1) Health and injury outcomes; 2) Chemical and physical exposure topics; and 3) Approach and Sector topics. These were listed in the Construction Compendium published in 2002 to communicate these priorities to researchers and construction stakeholders.

In 2001, the NIOSH Construction Steering Committee began planning for the next five year National Construction Center Cooperative Agreement announcement to be published in 2003. The Center RFA had resulted in projects that characterized hazards and developed and evaluated important construction interventions. But adoption of solutions by the industry had been uneven and uncertain, and gaps in understanding how to successfully diffuse effective interventions in the unique construction environment were viewed as important. This was prior to NIOSH's embrace of "Research to Practice" and the CSC used the terms translation and diffusion to describe these needs. Thus the 2003 RFA was structured to encourage translation and diffusion research in construction by calling for 20% of direct costs to be directed to translation projects. Additional language was added to focus on measuring impact. Lastly, the "High Priority Construction Topics" were also included to steer research towards high priority problem areas. See excerpts in Table A2.13.

**Table A2.13.** Excerpts from 2003 Construction Center RFA: (emphasis added)

.... The emphasis of the Construction Centers should be on addressing priority occupational health and safety issues using a multi-disciplinary approach. Translation projects focus on the translation of extant knowledge (e.g. peer reviewed articles) into products or practices that meet construction customer needs so as to maximize the impact on industry practices. **The NIOSH Construction Steering Committee has identified a number of priority topics in emerging areas of interest where research will most likely make a difference.** These NIOSH identified topics can be grouped into three categories:

**o Health and injury outcome topics which target:**

- 1. Leading types of fatal and non-fatal traumatic injuries in construction.**
- 2. Low back injuries and other cumulative work-related musculoskeletal disorders among construction workers.**
- 3. Occupational illness topics that focus on respiratory disease and hearing loss.** Respiratory disease includes airways disease, asthma, chronic obstructive lung disease, and silicosis.

**o Chemical and physical exposure topics which target vibration, asphalt fumes, lead, and dust particles.**

**o Approach and sector topics that target the following groups and issues within construction:**

- 1. Small and self-employed contractors.**
- 2. Special sub-populations at risk within construction such as Hispanic workers, day laborers, young workers, aging workers.**
- 3. The role of design as a primary prevention tool for addressing construction hazards.**
- 4. Addressing work organization in construction and improving understanding of how it affects health and safety.**

**5. Working with building owners and clients to promote and evaluate construction best practices.**

**6. Leveraging promising approaches from related high risk sectors such as agriculture and mining into construction.**

Other topics relevant to construction health and safety are also appropriate for this RFA. The significance of a project and relevance to the elimination of hazards in the construction industry must be fully described and developed in the application.

**...Intervention/prevention and translation projects should include process and outcome measures.** Process measures must be detailed enough to allow for replication in other areas. **Outcome measures of interest include, but are not limited to: exposure to injury hazards, knowledge of safety and health hazards, documenting safety and health behavior change, and changes in the incidence of disease, injury, or fatality.**

*(Note...Excerpt on Translation Projects provided below)*

#### TRANSLATION PROJECTS

(SHOULD BE AT LEAST 20% OF THE ANNUAL DIRECT COSTS)

These are projects that focus on the translation of extant knowledge (e.g. peer reviewed articles) into products or practices that meet construction customer needs so as to maximize the impact on industry practices. The Principal Investigator (Center Director) should view these projects as the tool to move the results from the research environment into the construction industry. As the goal for these projects is the adoption of new/improved knowledge in the construction sector, the principal investigator must include in the project plan how the study will accomplish this goal.

Translation projects may include but are not limited to technology transfer projects or demonstration projects that expand the use of effective interventions by a construction trade or industry group. Projects may address diffusion research issues to improve understanding of what influences construction industry decision-makers, workers, contractors, building owners, or others to adopt new practices, tools, and methods to improve safety and health performance. Participatory research projects, where research subjects and researchers work as active co-partners on translation issues are encouraged. Social marketing projects and other approaches that target important topics such as reducing construction fatalities at the industry, state, or national level are also appropriate.

Principal investigators are reminded that the intent of the Construction Center is not to support a collection of projects (exploratory, prevention/intervention, and translation). Rather, the goal for a NIOSH Construction Center is to support multi-disciplinary projects that are focused on a construction issue(s) in such a way as to have a meaningful and measurable impact on the problem.

This RFA was competed and the CPWR consortium scored highest and was again awarded the National Construction Center cooperative agreement. Several individual projects submitted as components of other Center proposals also scored well and three projects from Virginia Tech and one from Purdue were also funded as part of this cycle.

### **2005 to 2007 – Current Period - Strategic Goals, Research to Practice, and NORA 2**

In 2005, the Construction Steering Committee members met to begin developing “strategic goals” for the NIOSH Construction Program. This represented a further evolutionary change in strategic planning. The Construction Program had

previously developed “priorities” consistent with the language and approach used by the Institute for other programs. However, new approaches to government planning such as OMB’s Program Assessment Rating Tool (PART) approach placed increased emphasis on strategic planning, independent expert evaluation of research programs, and program performance measures (e.g. reducing fall fatalities by 20%). The overall focus for this goals development process was on making measurable contributions to society -where are the areas where research can most make a difference?

The Construction Program was the second NIOSH program after mining to develop strategic goals. The draft goals were discussed with construction stakeholders such as the Construction Center researchers, ACCSH, the Building and Construction Trades Department Safety and Health Committee, the National Safety Council Construction Committee, and the American Industrial Hygiene Association Construction Committee. The draft goals were also announced in the NIOSH e-news and posted on the NIOSH website for comments at <http://www.cdc.gov/niosh/topics/construction/draftgoal-inst.html>. After review by the NIOSH Leadership Team, the Construction Program began using these draft goals for internal project planning in 2005.

NIOSH announced a new initiative called R2P for “Research to Practice” in 2005 to emphasize the importance of projects and activities to guide and direct the use of research results. R2P was described as a new NIOSH initiative focused on the transfer and translation of research findings, technologies, and information into highly effective prevention practices and products which are adopted in the workplace. This was an important and relevant development for the Construction Program and the Construction Coordinator participated on the Institute workgroup charged with developing the concept. Construction Program initiatives, such as the 2003 language encouraging “translation” research was shared with the workgroup.

During this period, NIOSH leadership reviewed the status of NORA, which was entering the 9<sup>th</sup> year of a decade-long effort. NORA was viewed as successful, and a decision was made to continue a modified NORA for a second decade. NORA was re-oriented around industry sectors – and construction was selected as one of 8 sectors. A sector approach was viewed as a good fit with how labor and industry stakeholders were organized, and these groups were viewed as important for increasing R2P activities over the decade. The NORA2 concept involves each sector developing a “National Agenda” to address top problems for that sector over the next 10 years.

A NORA “Town Hall” meeting for the “Construction Sector” was held in Chicago in December of 2005 and a NORA webpage for submitting electronic comments was also established. The NIOSH Construction Steering Committee members transitioned to serving as the NIOSH representatives to the NORA Construction Sector Council, which held its first meeting with stakeholder candidates in March



of 2006. Construction was the first NORA sector to hold a Sector Council meeting. The NIOSH Construction Program members of the Council provided the draft Construction Program strategic goals as input to the process of identifying top problems. The March meeting identified some topics for additional discussion, and identified other construction groups to include on the Council for the next meeting. The Council met again in September of 2006 and identified a list of “top problems”. Additional information about the NORA Construction Sector Council, and the top problems identified is provided in Chapter 4 of the Evidence Package.

In December of 2006 NIOSH announced an internal competition for “Public Health Practice” projects to provide the new NORA sectors with opportunities for development of R2P and similar projects. The Construction Program successfully submitted several proposals, including one to pilot dissemination of construction safety information at big box hardware stores to reach small contractors and one to track use of NORA generated research by stakeholders over the next decade.

### **Strategic Planning during this period 2005-2007**

The Construction Program completed work on a set of draft strategic goals in 2005 to guide future research. However, a decision was made to hold up on completing the effort once the NORA2 sector effort had been launched in the meantime. The NORA2 effort also involves the development of construction sector goals and we believed that completing NIOSH Program goals prior to the NORA process might confuse some stakeholders about our intentions to participate in NORA and would deprive us of potentially valuable input via the NORA process. We revised our plan and contributed our draft NIOSH Construction Program goals as input to the NORA2 process for construction and announced our interest in adjusting our draft goals (especially intermediate goal concepts) and timeframes based on NORA sector council discussions and input.

The NORA Construction Sector Council has been formed and is discussed in more detail in Chapter 4. So far, there has been partial overlap between the draft NIOSH and NORA goal concepts under discussion. The NIOSH goals focus primarily on outcomes in accordance with PART concepts, whereas the NORA goals reflect stakeholder interest in cross-cutting and contributing factor construction issues as well. There is a strong overlap on the outcome topics identified by both processes.

NORA2 is being structured to provide goals that all construction stakeholders – both researchers and others – can use to drive activities over the decade. It is not intended solely for use by NIOSH. As with all other stakeholders, the NIOSH Construction Program will use the NORA sector goals as input to our activities, but we also plan to finish the process of developing NIOSH Construction Program goals as well.

## References

BNA. [1993]. OSHA expects to meet April deadline for construction rule, advisory group told. *Occupational Safety & Health Reporter*. February 17; 22(37):1625-6.

BNA. [1992]. Employers reminded of preventable hazards in trenching activities posed by warm weather.. *Occupational Safety & Health Reporter*. June 10;22(2):67.

Chapman, R.E. [2000] An Approach for Measuring Reductions in Construction Worker Illnesses and Injuries: Baseline Measures of Construction Industry Practices for the National Construction Goals. US Department of Commerce, National Institute of Standards and Technology. NISTIR 6473.

CPWR [1995]. Building a Safety Culture – Report of the Second National Conference on Ergonomics, Safety and Health in Construction. Center to Protect Workers Rights, December 1995.

Hassel, S, Florence, S, and E. Ettedgui. [2001] Summary of Federal Construction, Building, and Housing Related Research and Development in FY1999. RAND Science and Technology Policy Institute for the Department of Housing and Urban Development and the National Institute of Standards and Technology. 2001.

HP 2010. <http://www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa20.xls>

HP 2000. Final Review DHHS Publication No 01-0256 October 2001  
<http://www.cdc.gov/nchs/data/hp2000/hp2k01.pdf>

Meyers M. [1995]. National Program for Occupational Safety and Health in Construction at the National Institute for Occupational Safety and Health. NIOSH Notebook prepared for 7/19-21 1995 Review.

National Institute of Building Sciences (NIBS) [2001] Workshop on National Construction Goals as related to the Commercial and Institutional Building Sector, July 16, 1996. (Referenced by Hassel et al, 2001)

National Science Board (NSB) Science and Engineering Indicators 1998, 1998 (Referenced by Hassel et al, 2001)

NIOSH. [1994]. 1994 FACT BOOK: National Program for Occupational Safety and Health in Construction. DHHS (NIOSH) Publication No. 94-114.

NIOSH. [1997]. Construction - NIOSH Research Projects. DHHS (NIOSH) Publication No. 97-152.

NIOSH. [2003]. A Compendium of NIOSH Construction Research 2002. DHHS(NIOSH) Publication No.2003-103.

Ringen, K. [1995]. Occupational Medicine: State of the Art Reviews Construction Safety and Health.[1995]. Vol 10, No 2. April – June 1995. Edited by K. Ringen, A. Englund, and L Weeks.

Ringen K [2003] Evaluation of the CPWR Small Studies Program. Prepared for the CPWR Technical Advisory Board, Chicago, May 23, 2003

Rosenstock, L. C. Olenec, and G. Wagner. [1998]. The National Occupational Research Agenda: A Model of Broad Stakeholder Input into Priority Setting. AJPH March 1998, Vol 88, No. 3, p 353-356.

Snell, R.L. [1996]. An Evaluation of the National Program on Occupational Safety and Health in Construction: Report of an External Panel to review the Program. March 11, 1996